

WHAT IS CLAIMED IS:

1. A method for receiving animal waste from animal confinements or other concentrated animal waste sources and converting the waste into a usable form, the waste containing liquids and solids, said method comprising:

separating the liquids and solids into separate waste streams;

controlling an amount of moisture in the solids waste stream such that the amount of moisture in the solid waste stream is compatible with a selected energy conversion process; and

feeding the moisture controlled solid waste into the energy conversion process.

2. A method according to Claim 1 further comprising utilizing the energy conversion process to convert the moisture controlled solid waste into one or more of a fuel, heat, and power.

3. A method according to Claim 1 wherein controlling an amount of moisture in the solids waste stream comprises heating the solids waste stream to control a moisture content of the solids waste stream.

4. A method according to Claim 1 wherein separating the liquids and solids comprises routing the waste to one or more of at least one settling tank, at least one mechanical separator, and at least one buffer tank.

5. A method according to Claim 4 wherein the at least one mechanical separator is one or more of a belt press, a press, an auger, a conveyor, a centrifuge, a hydrocyclone, and a screen separator.

6. A method according to Claim 1 wherein separating the liquids and solids comprises:

recovering a portion of the solids from the waste stream using a mechanical separator; and

recovering further solids from the waste stream utilizing one or more gravity separators.

7. A method according to Claim 6 wherein the solids recovered from the mechanical separator and gravity separator are combined directly into a high-solids stream to be moisture controlled.

8. A method according to Claim 7 further comprising adding heat to control a moisture content of the high-solids stream.

9. A method according to Claim 1 wherein feeding controlling an amount of moisture in the solids waste stream comprises utilizing a combination of pressure, temperature and time to control moisture of the solids waste stream for one or more of gasification, pyrolysis, and liquification to convert the manure into fuel.

10. A method according to Claim 1 further comprising:

removing further solids from the liquid waste stream;

treating the liquid waste stream resulting in water; and

recycling the water.

11. A method according to Claim 10 wherein recycling the water comprises one or more of discharging the water for irrigation of cropland; delivering the water to animal confinement ventilation filtration units to capture airborne particles and gases, returning the water to manure pit for flushing and cleaning of the pit, and delivering the water to animals for drinking.

12. A method according to Claim 1 further comprising:

converting the moisture controlled solid waste into a fuel;

using the fuel in a power generation device; and

recovering heat from at least one of cooling water of the power generation device and exhaust from the power generation device to preheat the solids waste stream.

13. A method according to Claim 1 further comprising:

converting the moisture controlled solid waste into a fuel; and

recovering heat from at least one of the fuel, the steam, hot gasses, and hot fluid exiting the energy conversion process to preheat the solids waste stream.

14. A method according to Claim 1 wherein controlling an amount of moisture in the solids waste stream to be compatible with an energy conversion process comprises:

heating the solids waste stream to be applied to the energy conversion process using a heating and drying source;

sensing an amount of moisture in the heated solids waste stream to be applied to the energy conversion process with a moisture sensor;

sensing an output of the moisture sensor with a moisture controller; and

controlling the heating and drying source with the moisture controller to control an amount of moisture in the solids waste stream to the energy conversion process.

15. A system for processing a waste stream from animal production confinements and other sources of concentrated wastes, said system comprising:

a solids/liquids separator receiving the waste stream and configured to separate the waste stream into a solid waste stream and a liquid waste stream;

a water treatment apparatus for treating the liquid waste stream;

a control system for selectively controlling an amount of moisture in the solid waste stream;

an energy conversion processor receiving the moisture controlled solid waste stream and converting the solid waste stream into an energy source; and

a power generator configured to utilize the energy source.

16. A system according to Claim 15 further comprising one or more fuel storage tanks between said energy conversion processor and said power generator for storing fuel from said energy conversion processor.

17. A system according to Claim 15 further comprising at least one second power generator, said second power generator operation controlled by a controller configured to meet an electrical load demand.

18. A system according to Claim 15 wherein said power generator comprises one or more of an engine generator, a fuel-fired turbine, and a fuel cell.

19. A system according to Claim 15 further comprising one of a shredder, a pump, and a grinding pump, receiving a solids waste stream and providing a solid waste stream to said energy conversion processor.

20. A system according to Claim 15 further comprising a heat source heating the solid waste stream to said energy conversion processor.

21. A system according to Claim 15 further comprising a dryer removing moisture from the solid waste stream to said energy conversion processor.

22. A system according to Claim 15 wherein said dryer comprises a helical auger.

23. A system according to Claim 15 wherein said dryer comprises a blower.

24. A system according to Claim 15 wherein said solids/liquids separator comprises:

at least one buffer tank receiving the waste stream;

at least one mechanical separator receiving the waste from said buffer tank and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor; and

at least one settling tank receiving liquids from said mechanical separator, liquids from said settling tank being routed to said wastewater treatment apparatus, solids from said settling tank being routed to said buffer tank.

25. A system according to Claim 24 further comprising:

a heat source;

a dryer in the solids waste stream to said energy conversion processor using said heat source to remove an amount of moisture from the solids waste stream;

a moisture sensor sensing an amount of moisture in the waste stream to said energy conversion processor; and

a moisture controller configured to control said heater and said dryer to control an amount of moisture in the waste stream to said energy conversion processor.

26. A system according to Claim 15 wherein said solids/liquids separator comprises:

at least one buffer tank receiving the waste stream;

at least one mechanical separator receiving the waste from said buffer tank and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor;

at least one settling tank receiving liquids from said mechanical separator, liquids from said settling tank being routed to said wastewater treatment apparatus; and

a valve routing a portion of the solids from said settling tank being routed said buffer tank, and a portion of the solids to said energy conversion processor.

27. A system according to Claim 26 further comprising:

a moisture sensor sensing an amount of moisture in the solids waste stream to said energy conversion processor; and

a moisture controller configured to control said valve to control an amount of moisture in the solids waste stream to said energy conversion processor.

28. A system according to Claim 15 wherein said solids/liquids separator comprises:

a buffer tank receiving the waste stream;

a first mechanical separator receiving the waste from said buffer tank and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor;

a second mechanical separator receiving the liquid waste stream from said first mechanical separator and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor;

a settling tank receiving the liquid waste stream from said second mechanical separator, liquids from said settling tank being routed to said wastewater treatment apparatus; and

a valve routing a portion of the solids from said settling tank being routed to said buffer tank, and a portion of the solids to said energy conversion processor.

29. A system according to Claim 28 further comprising:

a moisture sensor sensing an amount of moisture in the solids waste stream to said energy conversion processor; and

a moisture controller configured to control said valve to control an amount of moisture in the solids waste stream to said energy conversion processor.

30. A system according to Claim 15 wherein said solids/liquids separator comprises:

a buffer tank receiving the waste stream;

a mechanical separator receiving the waste from said buffer tank and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor;

a first settling tank receiving the liquid waste stream from said mechanical separator and providing a solids waste stream and a liquid waste stream, the solid waste stream being routed to said energy conversion processor;

a valve routing a portion of the solids from said first settling tank being routed said buffer tank, and a portion of the solids being routed to said energy conversion processor.

a second settling tank receiving the liquid waste stream from said first settling tank, liquids from said second settling tank being routed to said wastewater treatment apparatus; and

a second valve routing a portion of the solids from said second settling tank being routed to said buffer tank, and a portion of the solids to said energy conversion processor.

31. A system according to Claim 30 further comprising:

a moisture sensor sensing an amount of moisture in the solids waste stream to said energy conversion processor; and

a moisture controller configured to control said first valve and said second valve to control an amount of moisture in the solids waste stream to said energy conversion processor.

32. A system according to Claim 15 comprising at least one of:

at least one heat exchanger configured to heat the solid waste stream via heat recovered from cooling fluid of said power generator;

at least one heat exchanger configured to heat the solid waste stream via heat recovered from one or more of steam and exhaust gases available from said energy conversion processor; and

at least one heat exchanger configured to heat the solid waste stream via a heat transfer medium circulated therethrough, the heat transfer medium heated from hot fuel from said energy conversion processor.

33. A system according to Claim 15 comprising a gas separator configured to separate a portion of the exhaust gas from said power generator for delivery to said energy conversion processor.

34. A system according to Claim 33 wherein said gas separator is a membrane separation device to concentrate the amount of a single gas for delivery to said energy conversion processor.

35. A system according to Claim 33 wherein said gas separator utilizes one or more of pressure-swing absorption, vacuum swing absorption, chemical separation, and catalytic separation.

36. A system according to Claim 15 wherein heat from said power generator is applied indirectly to said energy conversion processor by induction.



37. A system according to Claim 36 wherein said energy conversion processor comprises a jacketed pipe wherein heat from said power generator is applied as one of heated fluid or heated gas to said jacketed pipe to maintain desired temperature setpoints.